

as a typical representative, are found to be almost entirely converted by hydrolysis into two compounds: nearly 90 per cent. of their nitrogen, or 84 per cent. of their actual weight, is found as arginine (classes 1 and 2) and several per cent. of their nitrogen as monamidovaleric acid (class 3), the nature of the small remaining amount of product being as yet unknown. Basing himself on the qualitative simplicity of these products and the large preponderance of arginine, Kossel proposes, for the purpose of classification, to regard arginine, or rather the group from which it is derived, as the chemical nucleus of the albumin molecule, from which all the albumins may be derived by the addition of other groups. Increase in the complexity of the structure of the albuminous molecule is rendered evident by the appearance of a multiplicity of individual substances in classes 2, 3 and 4 of the products of hydrolysis. Thus sturin, a more complex protamine, yields only 58 per cent. of arginine, together with 25 per cent. of two diamido-acids (lysine and histidine, class 2), and a monamido-acid, the relations by weight showing that in this case four molecules of arginine are produced for one each of lysine and histidine.

A means of passing gradually from the chemical structure of these non-albuminous, ultimate products of hydrolysis back to that of the mother-substances, the albumins themselves, is afforded by the circumstance that the hydrolysis can be so effected, especially by means of the various proteolytic enzymes, that intermediate products, the albumoses and peptones, are formed. These, although certainly simpler in structure than the original albumins, still show the characteristics of the class, and it is the knowledge of their composition that must form the proximate object of research. For this purpose the intermediate products obtained from the protamines, which are known as the *protamines*, afford the simplest material, and the results of these researches will be eagerly awaited.

A certain amount of progress has indeed already been made in the examination of the albumoses and peptones derived from the more complex albumins, for it has been shown that certain of the constituent groups of the original molecule are absent from some of the albumoses derived from it, whilst present in others, a proof that the molecule has been divided into dissimilar groups. This is true, for instance, of the tyrosine- and indole-forming groups of fibrin, which are present in protalbumose, but absent from heteroalbumose.

The highest degree of complexity among the albumins is exhibited by the glucoproteids and the nucleoproteids, of the decomposition products of which an illustration has already been given. These appear to be compounds of albumins with other—*prosthetic*—groups, such as the hexoses, hexosamines, purine derivatives, &c., and even inorganic groups like phosphoric acid.

In conclusion, it is pointed out that the old idea of albumin as a substance of fixed and definite properties must be abandoned; it must be recognised that the albumins form a group comprising many substances which differ greatly in structure and properties. In accordance with the general principle of evolution, the aim of the investigator must be to find a chemical system of albumins which, progressing from the simplest up to the most complex member, shall reveal to us the true nature of these mysterious substances.

### SCOPE AND FUNCTIONS OF MUSEUMS.<sup>1</sup>

IT is my lot, as director of the Natural History Museum in London, to have my attention very closely directed to the question as to what a public museum should aim at, what should be its objects, and how it should be organised for effecting them. I am inclined to think that few people ever ask themselves why we have museums, how they came to exist, and why public funds are expended on them, both by municipalities and by the State.

The word "museum" is in itself a strange one, which has acquired a special and restricted meaning. In Germany a club for music and discussion of art and science, with the maintenance of a library, and sometimes with a beer garden attached, is often called a "museum," much as we call a club an Athenæum. In England and in France the word museum—by a process which I cannot trace—has within the past two centuries become applied

to what used to be called a "cabinet of curiosities (or rarities) of art and nature." You will find that all our great museums, and many local museums, owe their origin to such cabinets or collections of rarities. Thus the British Museum originated with the collections of Sir Hans Sloane, and the Ashmolean and University Museums at Oxford had as their nucleus the collection of miscellaneous objects of interest formed by the Cornish antiquarian and naturalist Tradescant. These collections were always, in the first instance, of the most miscellaneous kind. An elephant's skull, a glove worn by Queen Elizabeth, a thunder-bolt and a cannibal's spear are samples of the objects placed in these collections side by side. When such "cabinet" or "collection" of rarities attained to celebrity, its fortunate possessor (in the eighteenth century) made a habit of bequeathing it, or possibly selling it, to some public body, so that it might be maintained for ever as a show for the delight and instruction of future generations of men. That seems to be the origin of public museums, and it goes on repeating itself even at the present day. A collector gives his collections to a public body, to a city Corporation, or to the State, or to a local Board, or a Committee; the charge is accepted, and another "museum" is instituted.

Whilst it is certainly ungrateful to look a gift horse in the mouth, or to scrutinise too closely the collection bequeathed or presented by an enthusiast, yet it is a fact that this kind of spasmodic and unconsidered foundation of museums is inconvenient at the present day. We have now had some experience of museums, and a little reflection will show us what is the good and what is the bad of these miscellaneous collections, and what any public body should aim at when accepting or taking charge of a museum.

As distinguished from a library or a picture gallery, a museum, as we understand the term at the present day, is a repository in which are partly exhibited, partly stored, objects, tangible things, which are neither books nor pictures, but are actual relics of antiquity or samples of animal, vegetable or mineral structure of such a nature as to extend or to illustrate our knowledge of the history of man or of the natural world.

It seems to me—if I may go at once to the point without further preface—that a public museum, whether it be that belonging to a municipality such as ours here in Ipswich, or one belonging to the State, such as the British Museum, should have two distinct and recognised objects, the germ of which we can trace in the old collectors' cabinets of rarities of nature and of art. In the first place, such a museum must aim at collecting and preserving for the study and information of all men, but especially of those who live near it, the records of antiquity and of natural history in the locality of which it is the centre. A great part, even a half of the space of a museum building, should not be occupied by exhibition cases, but contain cabinets and cases in which precious things are preserved ready for the study of those who are willing to give time and skill to their study. But the second great object of a museum (present also in the old collectors' minds) is to exhibit in the most perfect and attractive way, in public show galleries, to all who choose to come and see, the most interesting, beautiful and instructive of the things in its possession, and especially to show such things as will readily excite an interest in the study of archaeology and natural history amongst the inhabitants of the town or city in which the museum is situated.

There is a third use of museums, and the collections in them, which ought, I think, to be very carefully separated from the two I have just mentioned. A student of text-books, preparing for examination and carefully pursuing his educational studies, requires specimens to handle and to manipulate closely. A collection suited for his purposes is quite different from the exhibition-collection addressed to the larger public, and ought never to be confused with it or with the record-collection of a local museum. These strictly collegiate and technical collections ought to be placed in colleges and schools, and kept apart from the more striking and generally interesting collections. When the public is admitted to such students' collections a great mistake is made. The ordinary man is bewildered and wearied by such minute details as are fit for the academic student, and becomes so bored and exhausted that the word "museum" has ever after an evil sound in his ears. You cannot appeal artistically and effectively to the casual well-meaning visitor to a museum if you show him endless rows of obscure objects, which nevertheless have value for the special student. My opinion is very strong that these two kinds of

<sup>1</sup> Abridgment of an address delivered at the opening of a new wing of the Ipswich Museum on November 8, by Prof. E. Ray Lankester, F.R.S., president of the Museum.

collections should be kept far apart, and I doubt very much whether the State or the municipality should undertake to set out and exhibit students' collections. They interfere, in my judgment, with the two great combined objects of a "public museum," namely, first to preserve objects of permanent interest and value, especially those of the locality; and, secondly, to excite in the general public—the ratepayers who pay for the whole affair—a pleasurable and intelligent interest in the purposes of the museum by the exhibition of a limited number of fine specimens, not crowded together, but well set out and beautifully housed and cared for.

Nothing is so hostile to the true spirit and purpose of a public museum as to exhibit in it dirty, ill-mounted, mean and contemptible specimens. Next to this, nothing is so bad for a public museum as to crowd specimens in the cases, so that none produces its due effect. After this, in order of harmfulness, come illegible and careless labelling and bad classification. Local museums suffer from want of funds to pay for good cases and good setting out of specimens, and for the printing of good labels. Still more, perhaps, do they suffer for want of funds to pay for the intelligent services of a curator. But in regard to this, I believe that when there is a great deal of voluntary service and personal help given in a town, with the object of making the museum a worthy show of which the town can be proud, there need not be much difficulty in paying the salary of a curator. I must, however, tell you that he ought not to have other work to do, if you wish him to keep your museum in a state of efficiency and beauty.

Perhaps one of the greatest difficulties which local museums suffer from is the ill-considered generosity of local collectors. I know of several museums which are rendered more or less ridiculous by the worthless collections of ill-stuffed birds or other such objects, presented and, I regret to say, accepted by well-meaning committees or trustees. No collection should ever be accepted with conditions attached to it unless money is also given for carrying out those conditions, and, as a rule, no collection whatever should be accepted *en bloc* from a private donor. The friends or relatives of a deceased collector very often seem to think that a public museum is a place where rubbish may be shot. This should not be allowed. The managers of a museum, with the advice of their curator, should have definite purpose and intention, and should know what they want and try to obtain it by gift or purchase. But they should not allow themselves to be the instruments of vanity or sentiment, and should never allow their museum to become a receptacle for rubbish, no matter by whom it is offered.

If I might venture to apply some of these remarks to the Ipswich Museum, I should say the Museum ought first of all to provide an absolutely safe repository for objects of antiquity found in the neighbourhood, extending from flint implements and Roman pots to old china, brass-work and wood-carving; also for the skins of rare birds and mammals taken in Suffolk, and for the fossils of the wonderful Red Crag, which is unique as a geological phenomenon in England. Such things should be cared for, labelled, and preserved with the greatest care. The best of these things should be exhibited in the best possible cases, with ample space, and in your best rooms, fully labelled and explained. It forms *the* local collection. But besides these, and as illustrating them and the sciences with which they are connected, you should have as many really fine examples of birds and mammals, of fishes, shells, starfish and corals as your space and your funds allow you to show in a really beautiful and attractive way. These also should be fully labelled and explained. That is a *sine qua non*. They should comprise such things as the skeleton of the horse and the man, side by side; of the lion and the cat; and a few other perfect and well-chosen examples of the skeletons of animals. Then you should have the whole or parts of recent elephants to illustrate the Mastodon of the Crag and the Mammoth of the river-bed of the Orwell. The skeleton of the recent bull should be compared with the extinct ones whose bones are dug up in the local gravels. Then a glimpse should be given of some of the utterly strange extinct monsters whose skeletons are preserved in larger museums, from which you can obtain complete casts, scarcely distinguishable from the original specimens.

I do not think there is any advantage in setting out on perches in the glare of daylight, which soon destroys their colour, a complete set of British birds. If you have these and their eggs, they should, excepting a few of the more striking, be unmounted and kept in drawers.

In such a Museum as this, plants, of course, will not be neglected. A herbarium can readily be formed and kept for reference and record. But for your exhibition cases there are many most interesting features concerning the seedlings, early and later growth, and changes of our native trees, which form most striking and instructive exhibits. In an agricultural county a set of models illustrating the life-history of wheat, such as has lately been set up in the Natural History Museum, would be greatly appreciated. Further, let me say that there is a no more beautiful and interesting class of objects for a public museum than really fine crystals and minerals of various kinds. The history of agates, and of the carnelians and other pebbles from the Felixstowe beach would form a delightful and most attractive case in the Ipswich Museum. But in no instance should there be a mean or dirty or ill-considered specimen in any one of your glass cases.

I think that the whole of one of the larger rooms in such a museum should be kept shut up and used for placing cabinets and for storing those specimens in glass cases with which it is not desirable to try the patience of the general public. They should be accessible on proper application; but why show all your doubtful specimens, your obscure though important fragments, your faded skins of birds and mammals to the public? It is not always right to destroy unsightly specimens, but it is never right to offend and disappoint the innocent visitor to a museum by thrusting them under his eyes. He wishes to be pleased, to learn something—not too much—but still something of natural history. You may lead him on by judicious exhibition to enthusiasm and serious interest in science: then he will be able to tolerate the sight of your sick specimens, but you gain a bad reputation for museums if you let your visitor be disgusted at the very first by incongruity and neglect.

A county museum is not a place for children or school-teaching: it is not Noah's Ark or Madame Tussaud's waxworks, but a place for the delight of grown-up men and women. It should be full of the things which are the pride of those who care for the history and natural life of their countryside, and just as you do not use a picture gallery to teach the elements of drawing, but for the enjoyment of fine pictures, so your county museum must be for the enjoyment by your grown-up, educated people of the rarities of nature and of art, and not for the cramming of schoolboys and schoolgirls.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The curators of the University chest have been authorised to spend 1050*l.* in erecting a new chemical laboratory over some of the existing rooms.

Prof. E. B. Tylor delivered a public lecture on November 22 upon totems and totemism, with special reference to the magnificent totem-post from British Columbia which he has recently presented to the Pitt-Rivers Museum.

Brasenose College has elected the keeper of the Ashmolean Museum to an *ex-officio* fellowship, which will have the effect of increasing his stipend by 100*l.* a year and augmenting the income of the Ashmolean Museum and the University Galleries by the same sum.

The 229th meeting of the Junior Scientific Club was held on November 20; a paper was read by Dr. Collier on "Health and Athletics," and Mr. A. T. V. Sidgwick read a paper on "Acetone Di-propionic Acid."

MR. E. H. GRIFFITHS, F.R.S., Fellow of the Sidney Sussex College, Cambridge, has been appointed Principal of the University College of South Wales and Monmouthshire in succession to the late Mr. Viriamu Jones.

THE first number of the *London University Gazette* has appeared, and is largely taken up with a statement of the constitution of the reorganised University and the conditions under which the work is now being carried on. The text is given of an address sent to Prof. Virchow on his eightieth birthday, and of one to Yale University upon the occasion of the recent bicentennial celebrations.

A COMMENDABLE characteristic of the Calendar of University College, London, is the list of original papers contributed by members of the scientific departments of the College to various